Exploring Gender Bias in Six Key Domains of Academic Science: An Adversarial Collaboration

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The range of life paths available to women has expanded significantly over the past century, in part because of increased access to higher education. While women earned just 19% of American college degrees in 1900, by 2000 they received more than 50% of bachelor’s degrees. Today, women earn 59% of master’s degrees and 53% of PhDs. Although this shift has allowed women across the globe to pursue exciting careers as researchers in the fields of science, technology, engineering, and mathematics (STEM), taking advantage of these opportunities has historically required women to take on significant gender bias within the world of academia.

But although the explicit forms of sexism faced by female academics in the second half of the 20th century are undeniable, it’s important to update our perceptions of gender bias in academia so that women are not needlessly discouraged from pursuing these career paths today, according to Stephen J.
Ceci (Cornell University), Shulamit Kahn (Boston University), and Wendy M. Williams (Cornell University) in *Psychological Science in the Public Interest* (Volume 24, Issue 1).

Ceci, Khan, and Williams’s analysis of hundreds of existing studies covering six aspects of academic life relevant to tenure-track professors suggests that the academy has indeed taken significant steps toward gender equality. Data from 2000 to 2020 suggest that women researchers are now equally likely as their male peers to be awarded grant funding, to have their journal articles accepted for publication, and to receive strong letters of recommendation. Moreover, they are more likely than comparable men to be hired for tenure-track positions.

In addition to highlighting the ways in which academia has become more welcoming for women, acknowledging these advances could help free up resources that could be used to address ongoing inequities related to salary gaps and biased student teaching evaluations, as well as larger systemic issues that may impede women’s career growth, the authors wrote.

Notably, Ceci, Khan, and Williams completed this project through a nearly 5-year adversarial collaboration, an approach to research that embraces viewpoint diversity as a method of countering ideologically driven assumptions about a topic. This collaboration required the researchers to challenge each other’s opposing perspectives on gender bias in academia in order to provide a more objective, evidence-based analysis of the subject.

1. **Women have an advantage in tenure-track hiring**

Through a review of existing studies and their own analysis of comprehensive data from the National Science Foundation, the authors found that although women remain underrepresented in certain academic fields, those who earn PhDs and apply for tenure-track positions are often more likely to be hired than comparable male peers. The exact hiring rates vary by field, with early-career women PhDs generally being more likely than men to be hired as tenure-track assistant professors in math-intensive fields such as geoscience, engineering, mathematics, computer science, and the physical sciences and equally or slightly less likely to be hired in less math-intensive fields such as the life sciences, psychology, and the social sciences.

However, previous research suggests that women are less likely to apply for tenure-track positions and that much of this disparity can be attributed to women who have or are planning to have children not applying for these roles because of their need for more flexible schedules, the researchers noted.

2. **Equality in grant funding varies by location**

In their meta-analysis of 39 studies including data from more than 2 million applications to 27 grant agencies, the authors found that although women with PhDs tend to receive less funding than men as a group, grants were awarded at roughly equal rates to women and men who applied for them. Previous work has shown that women are less likely to submit and resubmit grant applications, but when they do submit applications their chances of funding success are the same as their male counterparts.

Funding rates varied significantly with the granting agency’s location, Ceci, Kahn, and Williams noted.
Whereas women applicants in the United States were slightly more likely to receive grants than men, male applicants in Europe and Canada had a significant advantage.

3. Women receive worse teaching ratings despite equal student learning

Through a review of four existing meta-analyses as well as numerous individual studies, Ceci, Kahn, and Williams found that women academics receive lower and more abusive teaching evaluations from students despite being equally effective educators as assessed by more objective measures of student learning such as test scores. Both female and male students give female teachers worse ratings than their male colleagues. Female teachers tend to receive better ratings from students in humanities classes than students in STEM classes, and female teachers who speak English as a second language receive harsher evaluations than native speakers.

Universities could help limit the influence of biased student teaching evaluations by considering more objective measures of student learning when offering professors raises, promotions, and tenure, the authors suggest.

4. Gender does not affect journal acceptance rates

Ceci, Kahn, and Williams conducted a series of meta-analyses of manuscript acceptance rates in scientific journals from 2000 to 2020, including 33 articles with a total sample size of 410,504 journal submissions. They found that articles with female first and last authors were slightly more likely to be accepted for publication than those written by men, but that this advantage was small enough to be insignificant. Additionally, the authors noted that experimental studies have found that articles authored by women receive similar quality scores in both double-blind and nonblind review processes, suggesting that reviewers’ knowledge of an author’s gender does not generally influence an article’s perceived quality.

While these findings do not rule out the possibility of gender bias in specific fields or journals, they do indicate that there is no evidence of systemic gender bias in overall journal acceptance rates, the authors wrote.

5. The salary gap is smaller than often reported, but it adds up over a lifetime

From a review of previous research and their own analysis of data from the American Association of University Professors, Ceci, Kahn, and Williams found that although there is still a salary gap between male and female tenure-track professors, that gap is 60% to 80% smaller than commonly reported in the media. When differences in faculty rank, institution type, productivity, experience, and academic field are controlled for, the gap narrows to 3.6%, which although still concerning is far smaller than the 18% gap that is usually claimed.

However, even this seemingly minor difference in pay can have a significant impact on a person’s lifetime earning potential, the authors noted. This pay discrepancy may arise in part from systemic factors that encourage women and men to take different career paths and contribute to women’s increased use of family leave and pursuit of jobs that offer greater work/life flexibility but lower pay.
Studies have also shown that women are less likely to negotiate for a higher salary or pursue outside offers, which could be addressed by regularly auditing faculty pay to normalize salaries across a department, the researchers suggest.

6. Women and men receive similar recommendation letters for professorial positions

Some studies with student participants have found that letters of recommendation for other occupations may use different language and be interpreted differently depending on an applicant’s gender. But these findings do not appear to apply to recommendation letters written for would-be professors, the authors wrote. When the researchers compared the findings of nine studies that analyzed letters of recommendation written from 1990 to 2017 in the fields of psychology, physics, biology, medicine, chemistry, and geoscience, they found no evidence that letters written for women after the year 2000 were shorter, raised more doubts about their ability to do a job, or used different words to describe applicants than the letters written for men.

A potential mediator: Research productivity

Ceci, Kahn, and Williams’s review of data from self-report surveys, universities, grant agencies, journals, and bibliometric analyses found that men tend to author more publications than women—and that this gap may have increased over the past 20 years. Women publish as much as men when they are working as researchers, the authors explained, but they experience more career interruptions, are more likely to leave academia, and have shorter academic careers than men. An academic’s research productivity is a key metric that influences everything from hiring to salary setting and grant awards, but many studies do not control for this factor, which may incorrectly lead researchers to attribute certain career disparities to gender bias.

Researcher commentaries on the need for more flexible, balanced workplace cultures

In an accompanying commentary, Anne Preston (Haverford College) observed that Ceci and colleagues’ review of the literature on gender bias in academia gives women working in academic research reason to believe that many of their efforts will be rewarded similarly to those of their male peers, even while acknowledging that bias may persist in other domains.

Academic careers continue to be structured in ways that discourage women from entering or remaining in scientific fields, often leading them to escape the “rat race” for tenure by pursuing career paths that offer greater work/life balance at the cost of lower wages and underemployment, Preston wrote. She suggested that universities could help address some of these concerns by offering more formal mentoring programs and supporting more flexible paths to tenure-track positions and for financing research.

In a second commentary, Alexandra Garr-Schultz (University of Connecticut), Gregg A. Muragishi, Therese Anne Mortejo, and Sapna Cheryan (University of Washington) suggested paying further
attention to how masculine defaults shape life in academic institutions. Academia often favors stereotypically masculine traits such as independence, competitiveness, and self-promotion while undervaluing stereotypically feminine traits like interdependence, warmth, and collaboration, Garr-Schultz and colleagues wrote. This can disadvantage not only women but people of color and those who are lesbian, gay, bisexual, and transgender or nonbinary, who may face the double-edged sword of being passed over for opportunities for not embodying these masculine defaults or face professional backlash for behaving in ways that conflict with their stereotypically expected role.

What could help create more equitable workplace cultures? Removing unnecessary masculine defaults—such as the expectation that university students should have taken programming courses in high school prior to majoring in computer science, which is more common among men—according to Garr-Schultz and colleagues. They also suggest that academia could support cultural balancing by fostering feminine defaults, such as by considering researchers’ collaborative efforts and work toward diversity, equity, and inclusion in addition to individual accomplishments when hiring for leadership positions. In line with Ceci and colleagues’ analysis, the researchers stressed that interventions should be empirically evaluated to ensure that they are effective and don’t exacerbate existing disparities.

References


Preston, A. (2023). An academic career in science continues to be a hard sell for women: Putting Ceci et al. (2023) into a broader perspective. Psychological Science in the Public Interest. https://doi.org/10.1177/15291006231170832

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